

Can systemic immune-inflammation index (SII) be used to predict ovarian torsion

SII use in predicting ovarian torsion

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Abstract

Aim: Systemic immune-inflammation index (SII) has been used as a marker in several diseases, but its association with ovarian torsion is unknown. The aim of this study was to determine the diagnostic value of SII preoperatively in patients with ovarian torsion.

Material and Methods: In this retrospective study, preoperative neutrophil/lymphocyte ratio (NLR) and SII values were compared in 124 patients with surgically confirmed ovarian torsion and 107 control subjects without ovarian torsion.

Results: NLR and SII were statistically higher in the torsion group compared to the control group. The predictive performance of SII for ovarian torsion (AUC = 0.788) was better than NLR (AUC = 0.665). The preoperative NLR and SII cut-off values were 2.48 and 794.04, respectively.

Discussion: High SII values can be used to support the surgical decision in patients with suspected torsion. SII is a better predictor of ovarian torsion than NLR.

Keywords

Neutrophil/Lymphocyte Ratio, Ovarian Torsion, Systemic Immune Index

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Introduction

Ovarian torsion is a gynecologic emergency caused by interruption of ovarian blood flow due to partial or complete rotation of the ovary around its vascular peduncle. Initially, ovarian enlargement, edema, and interstitial hemorrhage occur as a result of impaired lymphatic and venous return, while ischemia and necrosis may develop due to interruption of arterial blood flow as a result of continued obstruction [1,2]. Although ovarian torsion is seen in all age groups, it is frequently seen in reproductive age [3,4]. Therefore, early diagnosis and treatment are very important for fertility preservation. However, since there are non-specific clinical and laboratory findings, diagnosis and treatment may be delayed. Torsion-induced ischemia may cause an inflammatory response. Therefore, there are studies showing that the use of hematologic inflammatory parameters such as neutrophil/lymphocyte ratio (NLR) is useful in the diagnosis of ovarian torsion [5-7].

The systemic immune inflammation index (SII), calculated by multiplying the NLR by the platelet count, is a new inflammatory marker that simultaneously assesses the inflammatory and immune status of patients [8]. Recent studies have found that SII is a prognostic factor in some malignant diseases [9-12] and is associated with unfavorable outcomes in chronic heart disease [8]. There are also some studies showing that it is associated with poor pregnancy outcomes [13,14].

However, the association of SII with ovarian torsion has not been reported before. The aim of this study was to determine the diagnostic value of SII in the prediagnosis of ovarian torsion.

Material and Methods

This study was performed among patients who underwent surgery for ovarian torsion and ovarian cyst at Konya Necmettin Erbakan University Hospital between January 2013 and January 2023. Patients with systemic diseases, pregnancy, endometriosis, tubo-ovarian abscess, and suspected malignancy were excluded. Patients were divided into an adnexal torsion group (124 patients) and a control group (107 patients) according to surgical findings. The medical records of the patients were retrospectively examined and demographic data, operative findings, and hemogram parameters obtained 4 hours before surgery were noted. NLR and SII values were calculated from complete blood count parameters according to the following formulas and compared between the torsion group and the control group.

NLR= neutrophil count/ lymphocytes count

SII= NLR x platelet count

Statistics

SPSS version 23 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses. The distribution of the data was analyzed by the Kolmogorov-Smirnov test. Continuous variables with normal distribution were evaluated by t-test and those without normal distribution were evaluated by the Mann-Whitney U test. The chi-square test was used to analyze categorical variables. The receiver operating characteristic (ROC) curve was used to determine the cut-offs, sensitivity, and specificity of NLR and SII. Continuous variables were expressed as means and standard deviations, categorical variables were expressed as numbers of patients and percentages. P- values < 0.05 were

considered statistically significant.

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Ethical Approval

Ethics Committee approval for the study was obtained.

Results

The study included 231 patients. Patients were divided into two groups according to surgical findings. In 124 patients, there was intraoperative ovarian torsion (torsion group) and in 107 patients, there was no ovarian torsion (control group). The mean age of the patients was 23,44 ± 5,716 years. In 89 patients (35,5%) the cyst size was 0-5 cm and in 26 patients

Table 1. Demographic characteristics of patients.

	Total (n=231)	Torsion group (n=124)	Control group (n=107)	P
Age (year)	23,44 ± 5,716	24,63 ± 6,809	22,06 ± 3,675	
Parity	,59 ± ,941	,77 ± 1,029	,39 ± ,786	
Cyst Size (cm)				
0-5cm	89 (%35,5)	71 (%34,7)	18 (%14)	
6-10 cm	116 (%50,2)	43 (%11,6)	73 (%27,3)	
> 10 cm	26 (%11,3)	10 (%3,3)	16 (%9,1)	
Laterality				
Right	145 (%62,8)	81 (%29,8)	64 (%33,1)	
Left	86 (%37,2)	43 (%19,8)	43 (%17,4)	
NLR	4,6131 ± 5,49325	4,3064± 4,53555	3,6579± 5,21348	,000
SII	1379,9141± 1453,86704	1799,7626± 1570,58056	893,3606± 1130,88041	,000

Table 2. ROC curve results for NRL and SII.

Variables	AUC (95% CI)	P-value	Cut-Off Value	Sensitivity (%)	Specificity (%)
NLR	0.665 (0.593-0.736)	0.000	2.48	69.4	63.6
SII	0.788 (0.726-0.849)	0.000	794.04	79	72

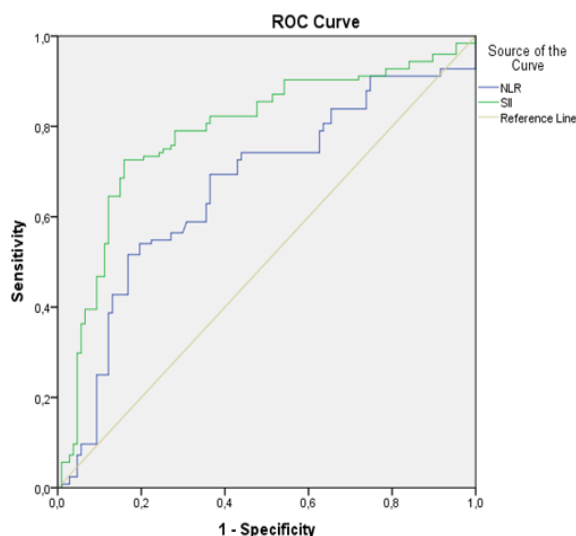


Figure 1. ROC curve of SII and NLR

(11,3%) the cyst size was over 10 cm. 62.8% of the cysts were located in the right adnexa. The demographic characteristics of the patients are summarized in Table 1.

NLR, neutrophil-to-lymphocyte ratio; SII, Systemic immune-inflammation index NLR and SII values were statistically higher in the torsion group. ROC curve analysis to evaluate the performance of NLR and SII in predicting ovarian torsion is shown in Table 2 and Figure 1. According to the ROC curve analysis, the AUC values for NLR and SII were 0.665 (95% confidence interval [CI]: 0.593-0.736) and 0.788 (95% CI: 0.726-0.849), respectively. Preoperative NLR and SII cutoff values were 2.48 (69.4% sensitivity, 63.6% specificity) and 794.04 (79% sensitivity, 72% specificity), respectively.

Discussion

To our knowledge, this is the first study evaluating the relationship between ovarian torsion and SII. Preoperative SII values were found to be higher in patients with ovarian torsion. This suggested that SII could be used to predict ovarian torsion. Ovarian torsion is a gynecologic emergency caused by twisting of the ovary around its peduncle, resulting in obstruction of blood flow. Ultrasonography (USG) is useful in preoperative evaluation. Gray-scale USG shows solid and cystic masses, edema, and increased ovarian size due to congestion. The absence of blood flow on Doppler USG has a high predictive value, but normal flow does not exclude the diagnosis. Approximately 45% of patients with ovarian torsion have normal preoperative USG findings and 60% have normal Doppler USG findings [15,16]. Early diagnosis and treatment are especially important for young fertile patients with a desire for pregnancy. Therefore, additional findings are needed to support the diagnosis. In adnexal torsion, ischemia and subsequent reperfusion cause an accumulation of activated neutrophils, which release reactive oxygen species (ROS). This is reflected in the complete blood count as an increase in inflammatory parameters such as WBC, neutrophils and NLR [17]. Serum markers such as interleukin-6 (IL-6) and SCUBE-1 have been shown to be useful in the early diagnosis of ovarian torsion [18,19]. However, there are limited studies on these markers and they are not suitable for practical use. In recent years, there have been studies showing that easily accessible, rapidly interpreted and cost-effective hematologic inflammatory parameters can predict the diagnosis of ovarian torsion. There is a consensus that NLR values increase in ovarian torsion and NLR predicts ovarian torsion [5-7]. Similarly, in our study, NLR values were found to be significantly higher in the torsion group compared to the control group.

SII was first described by Hu et al. in hepatocellular carcinoma and is calculated based on neutrophil, platelet, and lymphocyte counts [20]. It has been reported that SII can be used as a prognostic factor in some solid cancers and autoimmune diseases [9-12,20]. In addition, there are studies showing that high SII values can predict tubal ectopic pregnancy rupture and miscarriage [14]. In our study, it was observed that SII values were higher in patients with ovarian torsion in the preoperative period. Based on these data, it is thought that high SII values may predict preoperative ovarian torsion. However, ROC curve analysis showed that the AUC of SII was greater than NLR (0.788, 0.665, respectively). This suggests that SII has better

performance than NLR in predicting ovarian torsion.

Conclusion

High SII values may be useful in predicting torsion in patients with suspected adnexal torsion. However, we believe that prospective studies are needed to improve their application in practice.

Limitations of the study are its retrospective design and the small number of cases. Randomized controlled studies with more cohorts are needed in this regard.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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